

Direct relining of dentures with soft materials

ASK NIOM

Recent advances in dental materials give possibilities of new clinical techniques. Although easier to use, timesaving and more biocompatible than before, direct soft relining materials create new problems. An understanding of the clinical indications and limitations of these materials is crucial for clinical success.

What is the function of a soft liner?

Answer:

A soft liner may be defined as soft elastic and resilient material forming all or, a part of the soft tissue-contacting surface of a removable denture. Soft liners are mostly used for reducing local point pressures [1, 2]. They usually act as a cushion to distribute the masticatory forces transmitted to the underlying tissues but they do not necessarily decrease the force transmitted [1, 3, 4].

The success or failure of a soft liner is dependent not only upon the physical properties of the material employed. As well important is the understanding of the intended function of these products, and the physiological and biological properties of resilient oral tissues upon which the denture rests.

What are the clinical indications of direct relining with a soft liner?

Answer:

1. One major indication for soft liners is to reduce problems arising from the effects of age changes in the denture bearing tissues. The use of a soft liner can improve both masticatory efficiency and oral comfort for patients presenting a reduced thickness of the oral mucoperiosteum [5].

2. Radical surgical procedures, which result in maxillary defects, are usually followed by treatment with an obtura-

tor. For retention and peripheral sealing purposes, obturators may have to engage deep undercuts. Such undercut areas may be engaged by using a soft material [6, 7].

3. Soft liners are used for relining immediate or transitional dentures during the healing periods after tooth extraction and implant surgery. A soft liner is used to minimize direct pressure to the tissues.

New materials (vinyl poly(siloxanes) or addition-type silicones) with cartridge delivery systems, and longer shelf-life have much better handling properties than the materials used in the past. Before the application of a soft liner, the denture must be evaluated as clinically acceptable. The liner should not be used to compensate for a poorly made, ill-fitting prosthesis. A liner should be used only to improve a clinically acceptable prosthesis [8].

When should you remove an old and apply a new layer soft liner?

Answer:

International Standards Organization (ISO) categorizes liners used up to 30 days as short-term and liners used more than 30 days as long-term.

Short-term liners are usually tissue conditioners used immediately after surgery or for short-term treatments. These tissue conditioners usually consist of poly(ethyl methacrylate) powder, aromatic esters and alcohol. These materials do not contain methacrylate monomers [9]. Roughness, breakdown and hardening of tissue conditioners may usually begin in a matter of days. Thus, tissue conditioners may be used for a few days to a week but they should always be used as short-term materials.

Long-term soft liners are usually either a plasticized acrylic or a silicone. Plasticized acrylics usually have a shorter service life because of hardening and water sorption [8,10]. They are not dif-

ferent from the denture base polymers, or repair acrylics, with the exception of a high percentage of plasticizers. Plasticizers keep these materials soft but this property is lost over time. Acrylic soft liners could be used from one to six months [8]. After one to two months, the plasticizer begins to leach out, and the material loses resiliency. Therefore, the liner must be controlled regularly and replaced if necessary.

Long-term silicone soft liners are usually used for up to one year [8]. Currently, room temperature polymerizing vinyl poly(siloxane) materials (addition-type silicones), which have a similar chemistry to silicone impression materials, are used because of better handling properties and longer shelf life. Silicone soft liners often present problems with establishing a durable bond with the denture base, but this problem may be overcome by using a suitable solvent-based primer. According to a current clinical study, none of the silicone soft liners applied to complete dentures of 24 patients presented bonding problems after one year (unpublished results). Although having better handling properties than previously used materials, room temperature polymerizing vinyl poly(siloxane) materials also have limitations, and should be used as temporary materials. Regular controls to monitor the condition of the liner are therefore necessary.

Is there a risk of ingrowth of microorganism into the liner?

Answer:

The adherence of microorganisms to polymers, such as denture acrylic resin and soft lining materials, is the first step in colonization and development of an infection. There have been several studies on the adhesion and colonization of especially *C. albicans* to a range of dental materials. Significantly greater retention of *C. albicans* has been described on soft

lining materials compared with acrylic, and rougher surfaces also enhanced adhesion/retention [11, 12]. Clinically, it has been observed that some patients with silicone lining materials present small, whitish elevations of fungal growth on the surface [8, 12]. On microscopic examination, these were found to be primarily *C. albicans*. Therefore, in patients with a history of denture stomatitis and *Candida albicans*, a soft liner may exacerbate tissue discomfort [8]. The soft liner may also act as a reservoir for different microorganisms and cause repeating infections.

Could a soft liner be harmful to the mucosa?

Answer:

Currently, direct soft liners are categorized as acrylic and silicone soft liners and their properties differ. Acrylic materials usually consist of a powder and a liquid. They are mixed and directly applied to the mucosa. Various reports in the literature indicate allergic reactions to methacrylate monomers, and excess monomer is probably the cause [13–16]. Sensitization may be caused by repeated contact with allergy-inducing materials during dental treatment [15]. Apart from allergy, chemical or thermal burns generated from repeated or prolonged application of autopolymerizing relining acrylic resin to oral soft tissues, may result in traumatic stomatitis [17]. Possible adverse effects of chairside denture reline materials should be carefully monitored during, and after polymerization.

Phthalates and other esters of aromatic carboxylic acids are used as plasticizers in certain denture soft lining materials and tissue conditioners. Current laboratory studies show that the leaching of phthalate during the first day of use exceed tolerable daily intake by 11 to 32 times for different materials and this may

cause undesirable biological effects [18]. Clinicians should avoid using phthalate ester-containing materials especially when treating women during childbearing years [19].

The cytotoxicity of different silicone impression materials, which are similar to the soft liners, were analyzed in a laboratory investigation and the results showed that the addition-type silicones (vinyl poly(siloxanes)) are non-toxic even when tested after prolonged exposure of the cells, while the condensation-type silicones were cytotoxic at 24 h of incubation [20]. Although not reported previously for vinyl poly(siloxanes), allergic reactions should be always kept in mind because of applying fresh uncured polymer directly to the mucosa.

References

- Mack PJ. Denture soft linings: materials available. *Aust Dent J* 1989; 34: 517–21.
- Qudah S, Harrison A, Huggett R. Soft lining materials in prosthetic dentistry: a review. *Int J Prosthodont* 1990; 3: 477–83.
- Kawano F, Ohguri T, Koran IA, Matsumoto N, Ichikawa T. Influence of lining design of three processed soft denture liners on cushioning effect. *J Oral Rehabil* 1999; 26: 962–8.
- Kawano F, Tada N, Nagao K, Matsumoto N. The influence of soft lining materials on pressure distribution. *J Prosthet Dent* 1991; 65: 567–75.
- Kydd WL, Daly CH, Nansen D. Variation in the response to mechanical stress of human soft tissues as related to age. *J Prosthet Dent* 1974; 32: 493–500.
- Zarb GA. The maxillary resection and its prosthetic replacement. *J Prosthet Dent* 1967; 18: 268–81.
- Makila E. Soft lining to relieve soreness beneath dentures. *J Oral Rehabil* 1976; 3: 145–50.
- Garcia LT, Jones JD. Soft liners. *Dent Clin North Am* 2004; 48: 709–20.
- Brown D. Resilient soft liners and tissue conditioners. *Br Dent J* 1988; 164: 357–60.
- Parker S, Braden M. Water absorption of methacrylate soft lining materials. *Biomaterials* 1989; 10: 91–5.
- Verran J, Maryan CJ. Retention of *Candida albicans* on acrylic resin and silicone of different surface topography. *J Prosthet Dent* 1997; 77: 535–9.
- Bulad K, Taylor RL, Verran J, McCord JF. Colonization and penetration of denture soft lining materials by *Candida albicans*. *Dent Mater* 2004; 20: 167–75.
- Ergun G, Mutlu-Sagesen L, Karaoglu T, Dogan A. Cytotoxicity of provisional crown and bridge restoration materials: an in vitro study. *J Oral Sci* 2001; 43: 123–8.
- Giunta JL, Grauer I, Zablotsky N. Allergic contact stomatitis caused by acrylic resin. *J Prosthet Dent* 1979; 42: 188–90.
- Hochman N, Zalkind M. Hypersensitivity to methyl methacrylate: mode of treatment. *J Prosthet Dent* 1997; 77: 93–6.
- Stungis TE, Fink JN. Hypersensitivity to acrylic resin. *J Prosthet Dent* 1969; 22: 425–8.
- Bohnenkamp DM. Traumatic stomatitis following an intraoral denture reline: a clinical report. *J Prosthet Dent* 1996; 76: 113–4.
- Munksgaard EC. Leaching of plasticizers from temporary denture soft lining materials. *Eur J Oral Sci* 2004; 112: 101–5.
- Munksgaard EC. Plasticizers in denture soft-lining materials: leaching and biodegradation. *Eur J Oral Sci* 2005; 113: 166–9.
- Ciapetti G, Granchi D, Stea S, Savarino L, Verri E, Gori A, et al. Cytotoxicity testing of materials with limited in vivo exposure is affected by the duration of cell-material contact. *J Biomed Mater Res* 1998; 42 (4): 485–90.

M MURAT MUTLUAY
visiting scientist, PhD, DDS,

I. EYSTEIN RUYTER

dr.rer.nat., dr.philos.

NIOM, Nordisk Institutt

for Odontologisk Materialprøvning,

Kirkeveien 71 B, Postboks 70,

N-1305 Haslum, Norge

FOTNOT: Detta är den andra artikeln under vinjetten fråga niom år 2005. Den första publicerades i nummer 3.